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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/564,797

05/12/2006

Georg Saecker

1-17210

3337

1678 7590 01/27/2010
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EXAMINER

WU, IVES J

ART UNIT

PAPER NUMBER

1797

MAIL DATE

DELIVERY MODE

01/27/2010

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/564,797	Applicant(s) SAECKER ET AL.	
	Examiner IVES WU	Art Unit 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 October 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 4-5 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 4-5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

(1). Applicants' Amendments and Remarks filed on 10/20/2009 have been received.

Claims 1-3 were cancelled before.

Claim 4 is amended.

The 112 2nd rejection of claims 4-5 in prior Office Action is withdrawn in view of the Amendments and Remarks.

However, a new ground of rejections of claims 4-5 is introduced in the following.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

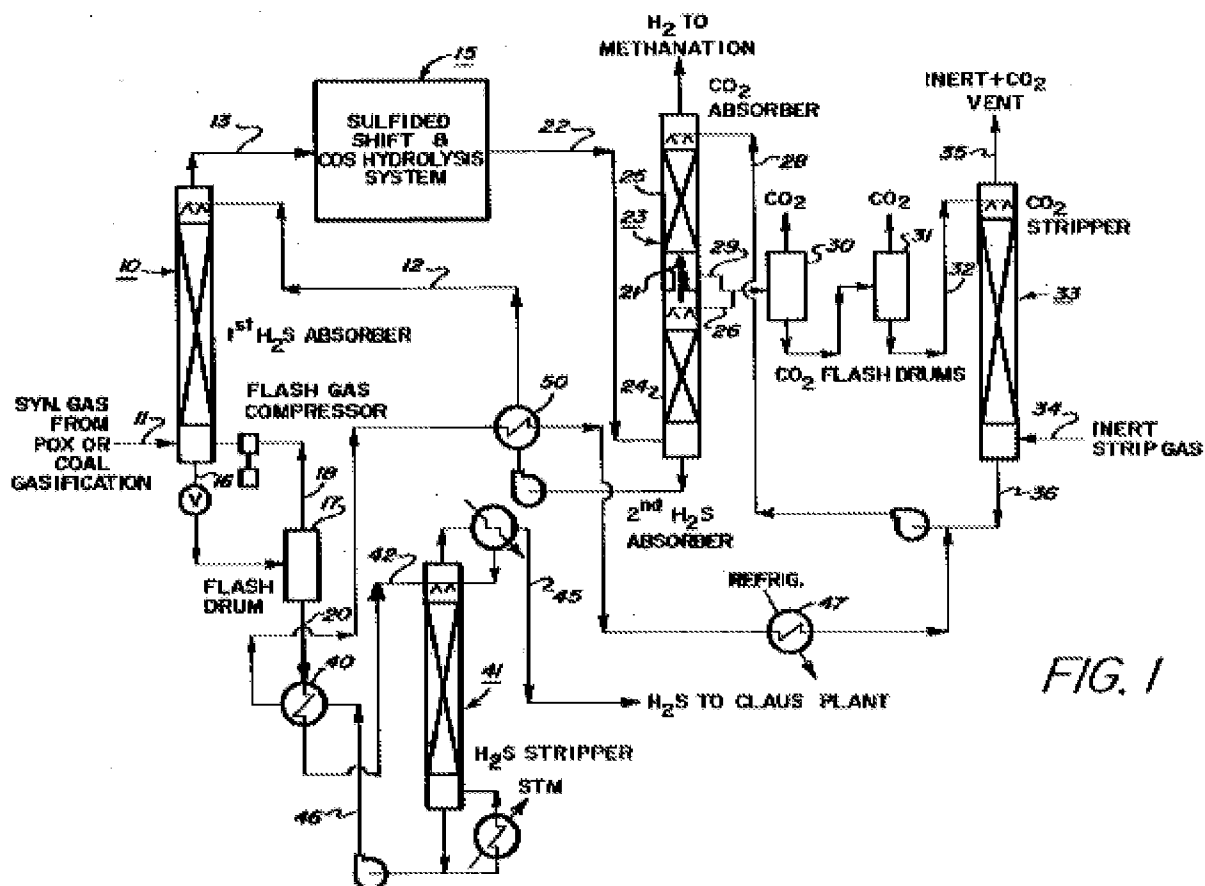
The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

(2). **Claims 4,5** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hegarty (US 4254094) in view of Peterman et al (US 4155987), Fenton et al (US 4206194).

As to a process for the removal of hydrogen sulfide and other sour gas components from industrial gases under pressure by means of physical scrubbing agents and for recovery of sulfur from hydrogen sulfide using a Claus plant in **independent claim 4**, Hegarty (US 4252094) discloses process for producing hydrogen from synthesis gas containing COS (Title). The novel sequence of operations employed comprises initially removing from the feed gas, such as from a synthesis gas derived from partial oxidation of coal or oil, the bulk of contained H₂S and a substantial part of contained COS by physical absorption in a suitable solvent. The H₂S bearing

solvent from 2nd treatment is used in the initial absorption. H₂S is stripped from the initial rich absorption bottoms liquid to recover a Claus gas effluent of high H₂S content, while the stripped liquid bottoms are recycled for further use in the process (Abstract). It is illustrated in the Figure below.



As to step of absorptively dissolving the hydrogen sulfide and the other sour gas components in a physically acting scrubbing agent in **independent claim 1**, Hargety (US 4254094) discloses, for most efficient operation of the process and obtaining all of its advantages, the solvent employed in absorption of H₂S should be one in which H₂S is more soluble than is CO₂ and the solubility of COS therein is intermediate that of H₂S and CO₂. Among examples of such solvents are included: methanol, propylene carbonate, N-methyl-2-pyrrolidone, and dimethyl ether of ethylene glycol. Although in certain of the known systems air may be employed in CO₂ stripper, it is best to employ nitrogen or other inert gas in stripper 33,

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since the solvent introduced therein contains some sulfur (Col. 5, line 5 - 61). The absorber 10 is shown in the Figure above.

As to step of regenerating the physical scrubbing agent in a multi-step regeneration, wherein the multi-step regeneration unit is equipped with at least one device each for CO enrichment, H₂S enrichment, CO₂ stripping and thermal regeneration in **independent claim 4**, as shown in the Figure above, the regenerated solvent line 12 with multi-steps and 2nd H₂S absorber 24 (H₂S enrichment), CO₂ stripper 33 (CO₂ enrichment), H₂ S stripper 41 (thermal regeneration). Hargety (US 4254094) discloses the rich solvent leaving the bottom of column 10 by line 16 goes to a flash drum 17 (CO enrichment). The flash vapors are withdrawn through line 18 and, after being compressed to the employed operating pressure, are returned to the bottom part of column 10. This flash re-compressor is to recover valuable co-absorbed H₂ and CO (Col. 3, line 32-38).

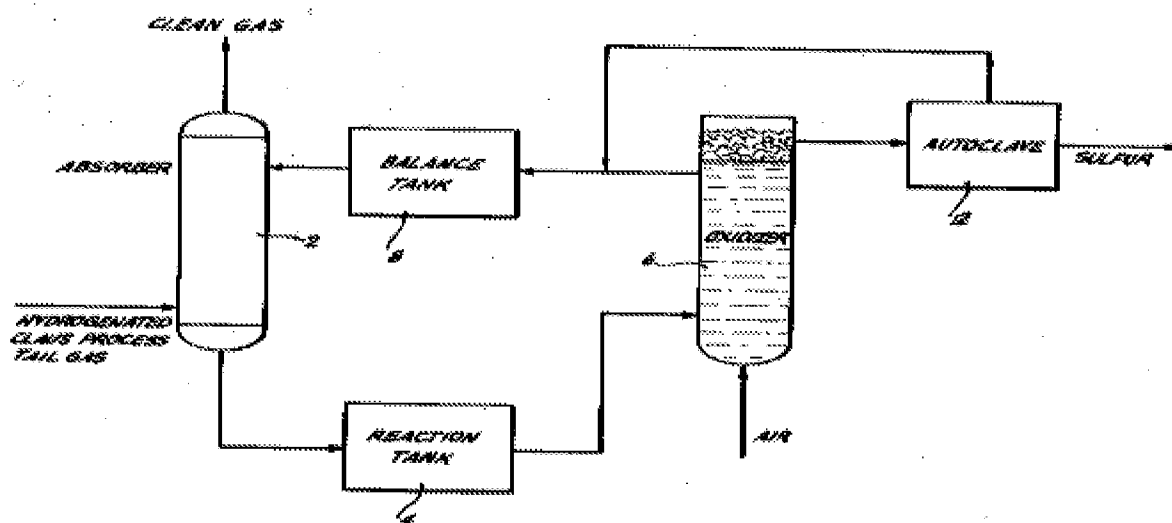
As to step of operating the various regeneration steps at pressure levels that differ from each other and are lower than that of the absorption unit in **independent claim 4**, Hegarty (US 4254094) discloses the feed gas being introduced into the 1st H₂S absorber at a pressure of about 674 psia (~46 atmospheres) and at 110°F (Col. 6, line 26 - 28). The flash drum would be operated at lower pressure than absorber 10, the absorber 41 will be at lower pressure than the pressure of flash drum in order to feed into the stripper because there is no pump between. The CO₂ absorber 23 is operated at pressure lower than absorber 10 because the pump next to heat exchanger 50, meantimes, higher than the pressure of the H₂S stripper 41 in order to maintain continuous flow operation between CO₂ absorber and H₂S stripper.

As to step of withdrawing a Claus gas rich in hydrogen sulphide from one of the regeneration steps and feeding it to Claus plant which produces sulphur in **independent claim 4**, as shown in the Figure above, the line 45 (H₂S to Claus plant). It is well known that Claus plant produces sulfur.

As to step of hydrating the tail gas leaving the Claus plant wherein the Claus gas rich in hydrogen sulfur is withdrawn from the device for thermal regeneration in **independent claim 4**, Hegarty (US 4254094) discloses the reboiler (STM) in figure above for the H₂S stripper and Claus gas rich in H₂S to the Claus plant. Hegarty **does not teach** hydration of the Claus tail gas as claimed.

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However, Fenton et al (US 4206194) **teach** reducing the consumption of anthraquinone disulfonate in Stretford solutions (Title). A process for treating a hydrogen sulfide-containing hydrogenated Claus process tail gas to convert the hydrogen sulfide to elemental sulfur in which the gas is contacted with an aqueous alkaline solution, yields an effluent gas of reduced sulfur content (Abstract). The drawing illustrates the operation of the Stretford process wherein hydrogenated Claus process tail gas enters near the bottom of absorber 2. This tail gas typically contains about 1-3 mol % of hydrogen sulfide; about 2-20 mol% carbon dioxide; traces of methane, water, carbonyl sulfide, carbon disulfide, elemental sulfur, carbon monoxide, methyl mercaptan and the remainder nitrogen (Col. 3, line 10-17).



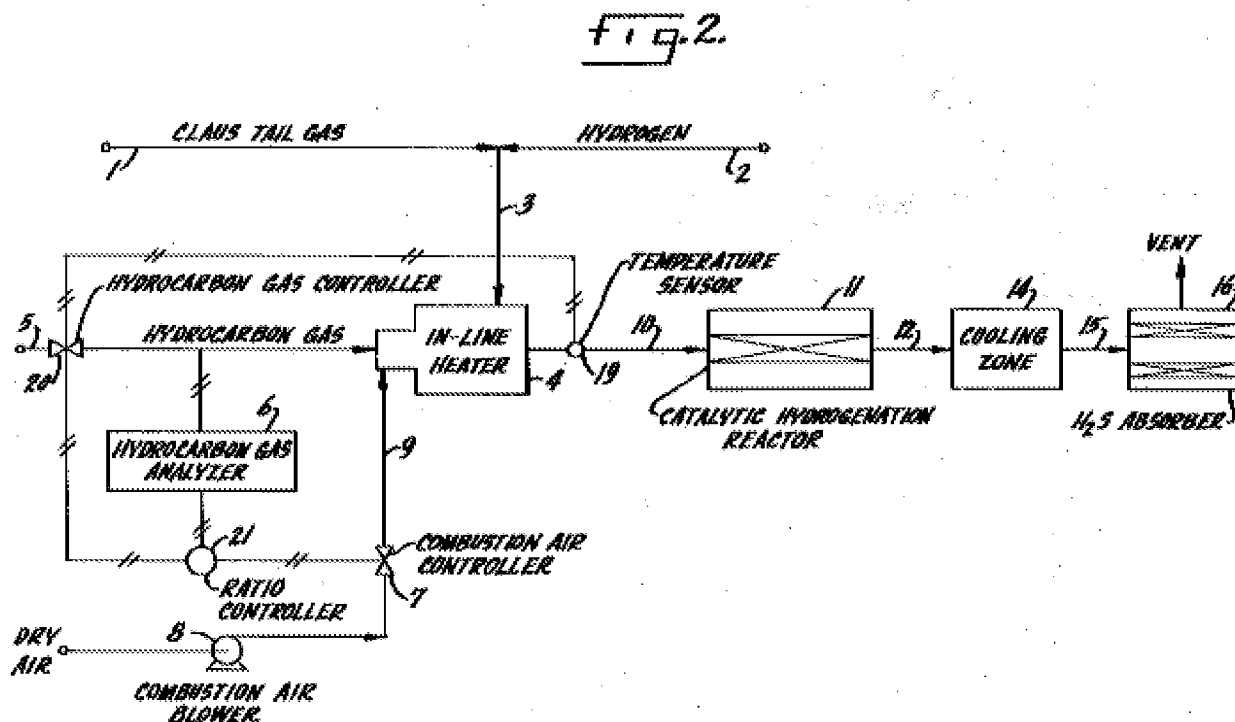
The advantage of contacting aqueous solution is to reduce the sulfur content in the Claus hydrogenated tail gas and produce elemental sulfur (Col. 2, line 30-33).

Therefore, it would have been obvious at time of the invention to install the aqueous solution wash step of Fenton et al for the tail gas leaving the Claus plant disclosed by Hegarty in order to attain the advantages cited herein above.

As to step of hydrated tail gas being compressed and fed to the device for CO enrichment in **independent claim 4**, Fenton et al, Hegarty **do not teach** compressing the tail gas and fed to CO enrichment device as claimed.

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However, Peterman et al (US 4155987) **teach** Claus tail gas recovery (Title). It is shown in Figure below. Hydrogenated Claus tail gas 15 is sent to H₂S absorber. It will feed to the flash drum 17 (CO enrichment unit). It would be obvious to have compression for the Claus tail gas for the delivery.



The advantage of sending the Claus tail to the absorber as well as flash drum is to recover the sulfur components as well as other acid gas from the hydrogenated tail gas.

Therefore it would have been obvious to install the hydration of hydrogenated Claus tail gas disclosed by Fenton et al in the recycle line 15 of Peterman et al configured in the Claus plant of Hegarty in order to achieve the advantages cited herein above.

As to step of a gas stream that is rich in CO₂ and enriched in CO relative to the hydrated tail gas is taken from a device for CO enrichment in **independent claim 4**, it would be obvious to have the flashed gas from flash drum 17 rich in CO₂ (high CO₂ content in feed gas as well as Claus tail gas) and containing more CO than the CO content (traces) in the hydrogenated Claus tail gas because the feed gas contains more CO to be co-absorbed than the CO content (traces) in the hydrogenated Claus tail gas.

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As to step of a gas stream that is poor in CO and rich in CO₂ is taken from a device for H₂S enrichment in **independent claim 4**, as shown in the Figure of Hegarty above, the gas stream line 21 which reads on the limitations as claimed.

As to wherein a process implemented as physical absorption is based on the Rectisol, Selexol or Morphysorb process in **claim 5**, it is well known that Retisol process uses methanol, Selexol process uses dimethyl ether of polyethylene glycol. These physical solvent are disclosed by Hegarty (US 4254094) in Col. 5, line 55-57.

Response to Arguments

Applicant's arguments with respect to claim 4 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IVES WU whose telephone number is (571)272-4245. The examiner can normally be reached on 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu

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Date: January 20, 2010

/Duane Smith/
Supervisory Patent Examiner, Art Unit 1797